The Merit/NSFNET Project

LINK LETTER

Information — *the commodity of the future*

Names such as Gopher, World Wide Web, Archie, Prospero, and WAIS, which once-upon-a-time may have evoked images of small furry animals and comic strip characters are rapidly gaining "household word" status among users of the Internet. These tools to help users find information on the network have spread from embryonic testing to widespread implementation in little more than a year.

To keep up with the demand for better access to information, Merit/NSFNET Information Services has upgraded its on-line information service by moving to an AIX-UNIX™ based server and implementing WAIS and Gopher to help users navigate files about NSFNET, NREN, and the Internet. File directories have also been reorganized to make it easier for Anonymous FTP users to locate specific information while maintaining e-mail access to documents as in the past.

Collaboration with other groups

In addition to these services, Merit is working with other groups to provide new network information services, including the TopNode project with the Coalition of Networked Information (CNI) and Indiana University (see page 7), with EDUCOM on an X.500 directory of K-12 individuals interested in network applications for teaching and with the IETF user-doc working group to implement a directory on introductory documentation. Merit is also exploring a cooperative project with the University of Michigan to build on the U-M software archives and improve access to these application programs which are widely copied by users throughout the world.

The new services being offered by Merit build on the earlier on-line systems which were based on an IBM 4381 mainframe running the CMS operating system implemented early in the NSFNET backbone project in 1988 (nis.nsf.net). This system made it possible to get information about NSFNET through Anonymous FTP and e-mail.

Types of information expanded

The new services, now implemented on an IBM RS/6000™ running AIX and provided by IBM, continue the existing services while also making it possible to use Gopher and WAIS to search the archives. In addition to running these new tools, the types of information have been expanded to include new directories aimed at providing information for new users. Directories for internet-drafts, and meeting minutes of the IESG and Working Groups of the IETF are shadowed. Merit's server makes it easy to do "one-stop shopping" for information about networking when accessing nic.merit.edu.

Directories and abstracts

Abstracts for each directory and a brief description of files in each sub-directory are found in INDEX files included at each level.

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Merit Seminar Scheduled for October 19–20 in Ann Arbor

An optional half-day, hands-on tutorial will be available. . .Staff will introduce participants to the tools of the Internet including WAIS, archie, and Gopher.

Once again the opportunity to learn more about the Internet and the many resources available through the NSFNET backbone service is at hand. A Merit/NSFNET seminar plus an optional, hands-on tutorial will take place October 19 and 20, 1992, in Ann Arbor on the campus of the University of Michigan.

This seminar is one in a continuing series put on by Merit to help network users better understand NSFNET and the Internet. Merit's seminars are nationally known for their high quality and the experts who participate. These seminars bring together computing center directors, network developers and administrators, information support specialists, librarians, teachers, and others who need to know the latest about networking for their institutions.

Participating Experts

Mike Roberts of EDUCOM, will give an "NREN Update" as the keynote address. "Internetworking Futures" will be the closing remarks of Douglas E. Van Houweling, UM Vice-Provost for Information Technology. Tom Grundner, President of National Public Telecomputing Network Cleveland Free-Net; Phill Gross, ANS and chair of the IETF; Karen Drabenstott, UM School of Information and Library Studies; and Clancy Wolf, UM School of Education Interactive Communications and Simulations program, will share their expertise.

Hands-on Tutorial

An optional three-hour, hands-on tutorial will be offered immediately following the seminar from 2:30 to 5:30 pm on Tuesday, October 20, for an extra fee of $79. During the class, experienced Merit staff will introduce participants to the tools of the Internet including WAIS, archie, and Gopher—the latest in friendly user interfaces. Space is limited so please register early to guarantee a place. Scholarships will not be given for the tutorial.

The seminar registration fee is $295 until October 5, 1992. After October 5 the cost is $345. This fee includes the one-and-a-half-day seminar, receptions on Sunday and Monday evenings, lunches on Monday and Tuesday, refreshments, access to Internet-connected computers, and all seminar materials.

For more information you may reach us electronically at **seminar@merit.edu** or by phone at **800-66-MERIT or 313-936-3000.**

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Phase 3 Upgrade to T3 Network Completed

Following the successful deployment of serial interface cards on all T3 routers during May, hardware upgrades at regional sites using FDDI will begin in late August. These modifications will increase performance and enhance the stability of the network.

Since the completion of the May deployment, all of the backbone-connected midlevel networks not previously sending their traffic through the T3 network have been moved. Migration of the remaining agency networks and international interconnections is expected to be completed by the end of August and planning is underway to dismantle the older T1 backbone.

T3 interfaces improve performance

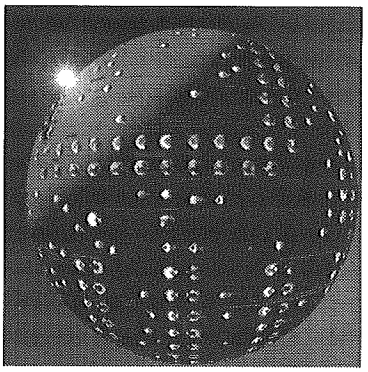
Between April 27 and May 23, the scheduled "Phase III" upgrade to the T3 network took place. All of the T3 adapters, DSUs, RS/6000™ planar boards, and cables were replaced with newer technology.

"The T3 network has been extremely reliable since November 1991," said Mark Knopper, manager of Internet Engineering at Merit. "The RS/960™ upgrade has enhanced network capacity such that the impact of moving the NSFNET traffic from T1 to T3 has been negligible."

The recent hardware upgrade is based upon an adapter technology known as RS/960 which supports on-card packet forwarding to other adapters connected across the IBM RS/6000 microchannel. The RS/6000 host is used as a network controller for route computation and network management. This technology supports up to five T3 interfaces per router. Packet rates over 10,000 pps with 200 bytes/packet and data throughput approaching 22.5 Mbps have been observed in routine testing on the independent ANS/Merit/IBM/MCI T3 test network, where the routers and circuits are configured similar to the production network.

Jordan Becker, Vice President for Network Services at ANS, which provides NSFNET backbone services under subcontract to Merit, noted that appraising router performance is not a straightforward task, and measurements of packets per second alone should not be used to evaluate the routers, or to compare them to other vendors' products:

"Approaching peak throughput on the T3 network requires carefully controlled conditions and applications that are specifically tuned to match the operating characteristics of the network," said Becker. "The performance that is currently observed by individual end users on the T3 network is generally more dependent on local access to the network rather than the high-speed backbone. However, some local networks can already access the backbone at more than 10 Mbps and technologies that achieve greater throughput in these cases are being tested."



Reports from the regional networks have confirmed that the Phase III upgrade went smoothly and successfully.

Extensive monitoring of traffic loads

Merit's Knopper points out that the NSFNET engineering staff performs extensive monitoring of traffic loads and peaks, routing table integrity, and other factors contributing to observed performance. "Any problems causing performance degradation are quickly identified and corrected. The staff also assists regionals in identifying problem sources which occur external to the backbone," he stated.

Users should contact their network administrators if performance problems are suspected in any part of the Internet. "There

See Phase 3, page 12

NSF Plans for Higher Speed Backbone in 1994

As proposed, the Network Access Points will be open to any network service provider meeting specified criteria, and traffic interchange will not be restricted by an acceptable use policy.

The National Science Foundation currently completed a comment period on its plans for the next phase of the NSFNET. In a draft solicitation released in June, NSF proposed a new program that will replace the current T3 (45 Mbps) backbone services with a 155 Mbps backbone, implement connection points among commercial and research and education network providers (Network Access Points or NAPs), and create a new routing entity, optionally available to providers connected at each NAP, to manage traffic exchanges.

vBNS projected for spring 1994

The very high speed Backbone Network Services (vBNS) are currently projected for operation in spring 1994, with a plan in place to extend the current T3 backbone for up to 18 months to assure a smooth transition. In addition to backbone services, the solicitation identifies a second project for a Network Access Point Manager and Routing Authority. This will separate services in the new program which are currently all managed under the single cooperative agreement with Merit. In the solicitation, the backbone services and NAP/Routing Manager must be distinct organizations.

As part of the comment process, the National Science Foundation has participated in several workshops, met with many individuals, and set up a mailing list for discussion of the draft solicitation. Comments ended on August 3, 1992 with a final solicitation to be issued in the fall. Proposals from all bidders will be due to NSF by the end of the year if this time schedule is followed.

Commercial access improved

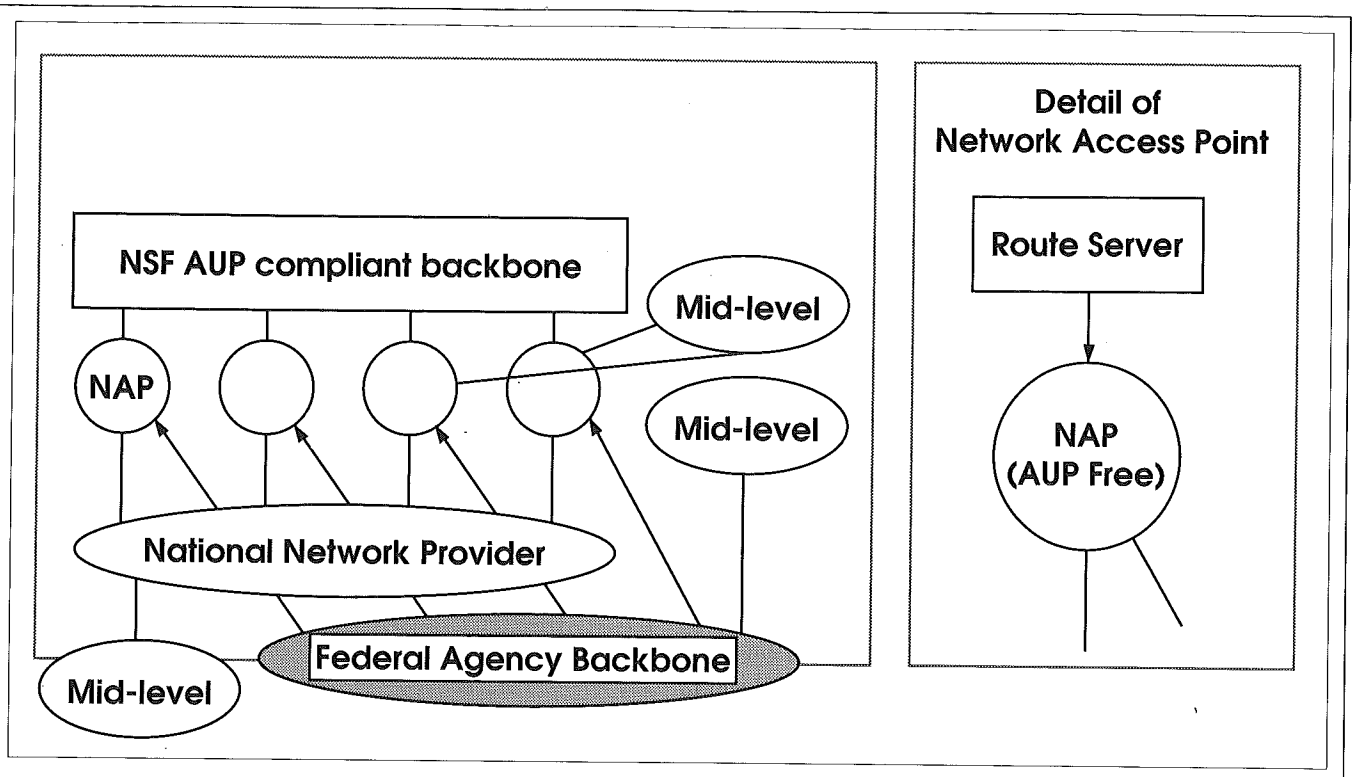
The new program meets the need for Internet connections for multiple providers, including commercial, federal and research and education networks. The NAPs will also provide access for research and education networks to the high speed services, meeting the needs of NSF's primary constituency. As proposed, the Network Access Points will be open to any network service provider meeting specified technical criteria, and traffic interchange will not be restricted by an acceptable use policy. The current plan is for approximately six NAPs, although NSF officials have indicated the actual number could be anywhere from one to twenty in the final solicitation.

By contrast, the vBNS will continue to have an acceptable use policy. Transit traffic will be limited to traffic supporting research and education. The vBNS will be connected to all the NAPs, and regional networks will be able to access it from these points. In addition to pioneering higher performance, NSF has included a specific request for the development of advanced routing technologies such as type of service and procedure routing, the ability to carry both CLNP packets (OSI's Connectionless Network Protocol) and IP (Internet Protocol) packets and provision for real-time multimedia services including multicasting and video teleconferencing.

Regionals also affected

The draft solicitation describes a direct impact on regional networks through a declining subsidy for connections to NSFNET services. The current plan calls for an attachment fee for networks connected to the NAPs, with a goal of having these fees provide a large fraction of the support for the NAP/Routing Manager rather than NSF funding. NSFNET midlevel networks are given the option of connecting directly to a

Continued on following page



Continued from previous page

NAP or to another network service provider which is connected to the NAPs. NSF will support the midlevel's connection for one year, with each midlevel required to find other sources for funding this connection in succeeding years.

Input solicited from FARNET

As part of the comment process, NSF met with regional networks during a workshop sponsored by FARNET (Federation of American Research Networks) on July 9-10 in Boston, MA. During that time, representatives from the regional networks, along with invited guests representing the telecommunications industry and the federal agency networks, proposed several recommendations for revising the solicitation, including a suggestion to separate the NAP Manager from the Routing Authority. The regionals encouraged NSF to move ahead with their plans, focusing on providing a smooth transition to the new services and recognizing that it will have a major impact on the regionals and networking in general.

"What this new plan is *not* is the broad vision of the NREN. Nor is it the general use 'national information infrastructure' that's been talked about," said Robert Aiken, Program Director for the NSF's National Research and Education Network (NREN). "It is primarily for research and education in the sciences. While it may be used by lots of other people and that's good, that's not what this is. This idea may change the way you think about this plan."

Aiken noted that NSF's goals for the plan are to advance the leading edge of network technology and services, increase the ubiquity of network access to the research and education community, and accelerate private sector technology development and deployment.

"There is no way to meet all needs given the dollar figure NSF has—it's not a bottomless budget," said Aiken. He noted that NSF must continue to work with the regionals and others for the success of this project. "We have to get the highest leverage possible, so it must be a team effort."

Solicitation on-line

The draft solicitation is on-line and can be obtained from the Merit information server at **nic.merit.edu**. in the /cise/recompete directory. Several related documents are available in the same directory which give more background on NSF's proposal.

Proposed "very high speed Backbone Network Services" (vBNS)

Computers Bridge the Gap between Kids and Seniors

Ed. note: This article is reprinted from the MichNet News, *Volume 7, Number 2 (June, 1992).*

The idea is to be able to create a biography of the senior's life based solely on information exchanged over the network.

Jan Simms' third grade students at Hickory Grove Elementary School in Bloomfield Hills, Michigan, are as comfortable with telecommunications as most children are with Nintendo. This is a direct result of using an easy-access bulletin board system based in Lansing, practicing on-line communications with another local school, and then incorporating this hands-on experience into an interesting and rewarding class project, writing senior citizens' biographies.

One of the Bloomfield Hills school buildings houses a drop-in center for senior citizens and also has a computer and modem available for their use. The third graders use their classroom equipment to post questions for these seniors on the Lansing bulletin board, and the seniors post answers in the same way. The idea behind the questions is to be able to create a biography of the senior's life based solely on information exchanged over the network.

Seniors, who are sometimes housebound but otherwise healthy, can reach out to a new community of friends using computer networking.

According to Simms, the project with the 'Mature Minglers,' as the seniors' group is known, serves a double purpose. "We were looking for integration of technology fully into the classroom," she explains, "but we were also looking for a way to create a relationship with a very, very important part of our community."

"We have so many single parent families where the kids never see their grandparents. We think it's important for them to have close contact with the older members of our society."

Kids fund phone line for senior partners

The students take this biography writing project very seriously and were frustrated at the slow responses they got from the seniors. Once the students realized that this was not due to lack of interest on the seniors' part, but rather the fact that they had to share a phone line with others in the building, the students took action to remedy this problem.

The third graders held numerous fund-raisers at Hickory Grove, including selling popcorn, and raised enough money to have a dedicated phone line installed expressly for the senior citizens.

Students publish biographies

After compiling all the necessary information, the students use their computers to write and illustrate the biography. They incorporate maps from their geography lessons and produce graphics of themselves for the back cover of the book. At the end of the project, students meet their senior citizens at a party and give them the book they made about their lives. Although they have never actually met, the two groups interact like close friends, sharing smiles and hugs.

"This is the second year we've run the project," says Simms, "and I've just finished downloading all the seniors' information from the bulletin board. It's amazing what these people, men and women alike, have accomplished in their lifetimes."

The rewards of a telecommunication project like this one are an inspiration for others. Networks allow people to communicate who each have much to learn and much to share, even when they are physically separated. Seniors, who are sometimes housebound but otherwise healthy, can reach out to a new community of friends using

See Kids and Seniors *following page*

Work Continues on TopNode Project

The Coalition for Networked Information (CNI), Indiana University and Merit continue work on TopNode, an Internet directory project. CNI is a consortium formed by American Research Libraries, CAUSE, and EDUCOM to promote the creation of and access to information resources in networked environments in order to enrich scholarship and to enhance intellectual productivity.

Indiana University's responsibilities in the TopNode project include collecting, cataloguing and entering the TopNode data as well as working with CNI to coordinate the project. Merit's responsibilities include sharing knowledge about network resources, assisting in the gathering of such information, and creating an X.500 version of the TopNode directory.

Currently the TopNode participants have defined the data elements for cataloguing directory and application information about Internet resources. Work is now underway to actually implement the catalog, with over 200 resources identified and being described. Work continues on developing a beta version of the TopNode directory.

For further information contact: NSFNET-info@merit.edu or telephone (313) 936-3000.

—Laura Kelleher, Merit/NSFNET

Kids and Seniors,
cont. from previous page

computer networking.

Successful ventures like this one, involving diverse age groups, help dispel the misconception that networks are hard to use. They pave the way for more such creative projects in the future.

Simms and her husband, who teaches in the Waterford school district and who runs a similar project in his classes, will be presenting information about the projects in Washington this spring. They will be taking sample biographies, a video they've made on the project, and other information before two groups, the National Council on Aging and Generations United.

Contact Jan Simms at (313) 540-5287 for more information about this project.

— Alicia Smykla, Merit Network, Inc.

Soviet Papers Available via Anonymous FTP

The Special Projects Office, Library of Congress has announced that the exhibit "Revelations from the Russian Archives" opened June 17, 1992 at the Library of Congress. Those who wish to retrieve selected portions of the documents contained in the exhibit may follow the following instructions.

The README file gives information about the documents available. Continue to transfer files of interest using "get [filename]". Files are in ASCII format and are not very long (no need for compressed files). For those files with the extension .GIF (images of original Russian text) you need some type of GIF viewer. This software is available in the public domain on bulletin boards.

*A sample ftp login is shown below with user input in **boldface** type:*

```
ftp  seq1.loc.gov
Connected  to  seq1.loc.gov
220 seq1 FTP server    ready
Name  (seq1.loc.gov):  anonymous
331 Guest  login ok,  send ident
as  password.
Password:    psmith@merit.edu
230 Guest  login ok,  access
restrictions  apply.
ftp>  cd  pub/soviet.archive
250  CWD  command  successful.
ftp>  get  README
```

Information, *cont. from page 1*

The README file outlines Anonymous FTP and electronic mail query access and presents an overview of the directory structure. Merit/NSFNET Information Services also provides resources on the nic.merit.edu host via electronic mail query. Details for connecting to nic.merit.edu, as well as an overview of the directories, begin on page 9 of this issue.

WAIS at Merit

WAIS (Wide Area Information Servers) allows users to search quickly through terabytes of data from the government, educational institutions, libraries, and other information providers. It is based on the Z39.50 standard for information exchange. Because the protocol is non-proprietary, it is anticipated that many vendors will become involved in providing WAIS services. (See the March/April 1992 issue of the Link Letter for more details on WAIS.)

Obtaining WAIS clients

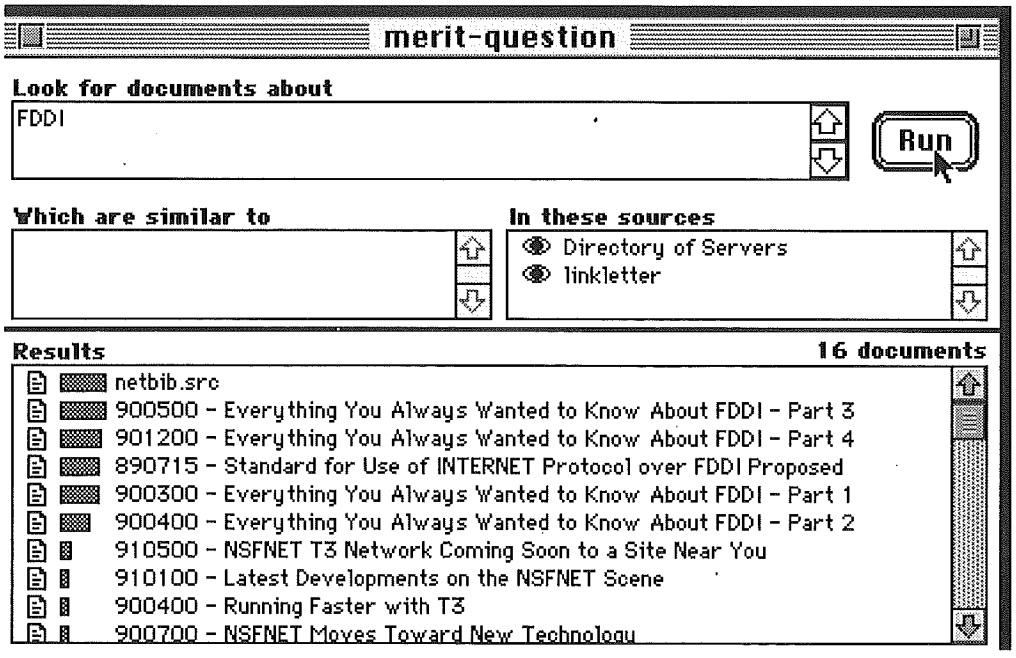
Users may install and run WAIS client software on any desktop computer which is connected to the Internet by TCP/IP. The WAIS software for Macintosh and UNIX machines is available for anonymous ftp from ftp.oit.unc.edu in the pub/wais directory. WAIS software for VMS, DOS, and MS-Windows is at the same ftp site in the pub/wais/UNC directory.

Six databases have been made available on the Merit WAIS server and there are plans for adding more. A WAIS client identifies where servers are and what databases are offered from "source" files.

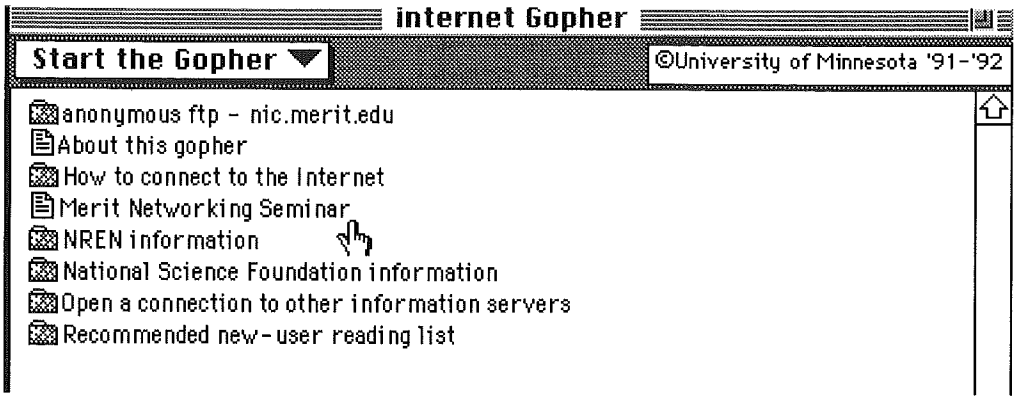
The usual way to obtain these source files is from the "Directory of Servers" on the WAIS server at think.com. (Thinking Machines Corporation is a prime mover in WAIS development). Every WAIS client comes with a source file that can connect to the Directory of Servers. Users can find the

See Information, *following page*

Users may install and run WAIS client software on any desktop computer which is connected to the Internet by TCP/IP.



Information, *cont. from previous page*



The Merit Gopher server main menu as displayed by the Macintosh Hypercard client. Client software is available for Anonymous FTP from boombox.micro.umn.edu

Merit sources illustrated on p. 8, as well as hundreds of others, in the Directory of Servers.

Further WAIS information

A mailing list features weekly postings on WAIS progress and new releases; to subscribe, send an email note to wais-discussion-request@think.com.

Gopher at Merit

The Merit Gopher server allows for Anonymous FTP access to the wide array of network information on nic.merit.edu. Recent information resources to help the network novice become familiar with the Internet, including its associated networks, resources, and protocols, may be selected from the "Recommended New-User Reading List." "National Science Foundation Information" includes the NSFNET Backbone Services Acceptable Use Policy and current NSF proposals for the Interim Interagency NREN. Connections to other information servers will also be possible.

Individuals can obtain Gopher client software for Mac, DOS, UNIX, VAX/VMS, VM/CMS and other common operating systems via Anonymous FTP to boombox.micro.umn.edu. This client software enables one to access any of the hundreds of Gopher servers on the Internet, including Merit's server on nic.merit.edu.

—Merit/NSFNET Information Services

Directories of interest on nic.merit.edu

acceptable.use.policies/ A directory of policy statements for the acceptable use of the NSFNET backbone and regional networks listed.

cise/ Directory owned by the National Science Foundation's Directorate for Computer and Information Science and Engineering for the placement of NSFNET Backbone Network policy statements and related documents, as well as GAO reports of interest. NSF's Interagency Interim NREN Implementation Plan may be found in the subdirectory **cise/recompete/**.

internet/ Directory devoted to Internet activities: legislative work to promote the NREN, publications on research, experiments and use of the Internet, and available resources, including the subdirectories:

internet/documents/ Publications documenting activity on the Internet, in the realms of education and research by participating organizations.

See Directories, *page 10*

Directories, *cont. from page 9*

internet/documents/fyi/ The FYI (For Your Information) sub-series of Request For Comments (RFCs), designed to provide a wide audience of Internet users with a central repository of information about any topics which relate to the Internet.

internet/documents /iesg/ Minutes of the most recent IETF Steering Group meetings.

internet/documents/ietf/ Current information on Internet Engineering Task Force activities including a general description of the IETF, summaries of ongoing working group activities, and information on past and upcoming meetings.

internet/documents/internet-drafts/ A directory of draft documents which will ultimately be submitted to the IAB and the RFC Editor to be considered for publishing as RFC's.

internet/documents/rfc/ Request For Comments: a document series which describes the Internet suite of protocols and related experiments.

internet/documents/std/ The Standards are the sub-series of notes within the RFC series which document Internet standards.

internet/newsletters/ Includes the Internet.Monthly.Report

internet/resources/ Information on using the Internet and its available resources, including Merit's Internet Cruise.

internet/routing.policies/ Information on routing policies of the networks in the Internet which are usually in the form of ASs (Autonomous Systems).

introducing.the.internet/ A directory providing recent information resources which will help the network novice become familiar with the Internet, including its associated networks, resources, and protocols.

maps/ PostScript maps of NSFNET and MichNet.

nren/ House and Senate activity pertaining to the National Research and Education Network (NREN), including:

nren/hpca.1991/ House and Senate activity leading to passage in 1991 of The High Performance Computing Act.

nren/iita.1992/ House and Senate activity relating to The Information Infrastructure and Technology Act of 1992.

nsfnet/ Archive for administrative, policy and statistical information relevant to the NSFNET Backbone networks, among which are the subdirectories:

nsfnet/engineering.report/ The monthly NSFNET/ANSNET Backbone Engineering Report as published in the Internet Monthly Report.

nsfnet/linkletter/ The Link Letter, a bi-monthly NSFNET newsletter.

nsfnet/resources/ Information files on using the NSFNET and its resources, including Merit's Internet Cruise.

nsfnet/statistics/ Directory of statistical information files collected on the NSFNET Backbone networks. Reports are divided into subdirectories according to the year the data was collected.

Using Anonymous FTP

The resources of nic.merit.edu are available via anonymous FTP (File Transfer Protocol). A sample login is shown below with user input in boldface type.

```
ftp nic.merit.edu
Connected to nic.merit.edu
220 nic.merit.edu FTP server
(Version 4.1) ready
Name (nic.merit.edu:abcd):
anonymous
331 Guest login ok, send
ident as password.
Password:    psmith@merit.edu
230 Guest login ok, access
restrictions apply.
```

Useful ftp commands

dir (directory) displays a listing of the files in the current working directory.

ls (list) command is similar to dir, but provides a brief listing of files in the current working directory.

get initiates the transfer and copies the specified file to a file of the same name on the user's local disk space.

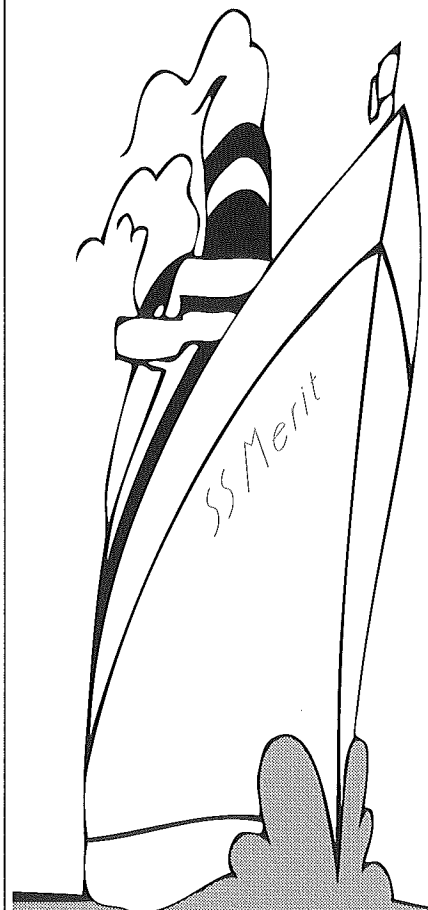
cd (change directory) moves from one directory to another.

For further information on any of these projects at Merit send email to: nsfnet-info@merit.edu or telephone 313-936-3000.

"Won't you let me take you on a sea cruise? "

The Merit staff has developed a colorful desktop cruise that helps new users learn about the Internet and explore its resources. Currently available for the Macintosh, the "Cruise of the Internet" provides an overview of tools and applications found on this international collection of TCP/IP networks.

The Cruise is available via anonymous FTP from **nic.merit.edu** and comes as a compressed, self-extracting file.



The following hardware and software are necessary to take the cruise:

- A Macintosh II™ or Quadra™ series computer
- 8-bit color and any color monitor (13" minimum recommended)
- System 6.05 or 7.x
- Approximately 2 MB of disk space
- 4 MB of RAM is recommended

Get the Cruise via FTP

The Cruise is available via anonymous FTP from **nic.merit.edu** in the directory, **internet/resources**. The file is called **merit.cruise.sea.hqx.** A separate readme file is available as **merit.cruise.readme.txt.**

How are we doing?

This beta version (1.0.ß) is being distributed without charge for your evaluation and use. Future versions are under development, including a version which will run under Windows on PCs.

Merit is interested in what you think of this presentation and how you might want to use it. Please send your comments via e-mail to:

cruise-feedback@merit.edu

You may copy and distribute the Cruise without charge. You must include the readme file with the Cruise, and you may not charge any fees for the distribution of the Cruise.

The Cruise presentation was created by Steve Burdick of Merit Network, Inc., using Macromind Director™. It is based on a presentation written by Laura Kelleher and Mark Davis-Craig, also of Merit.

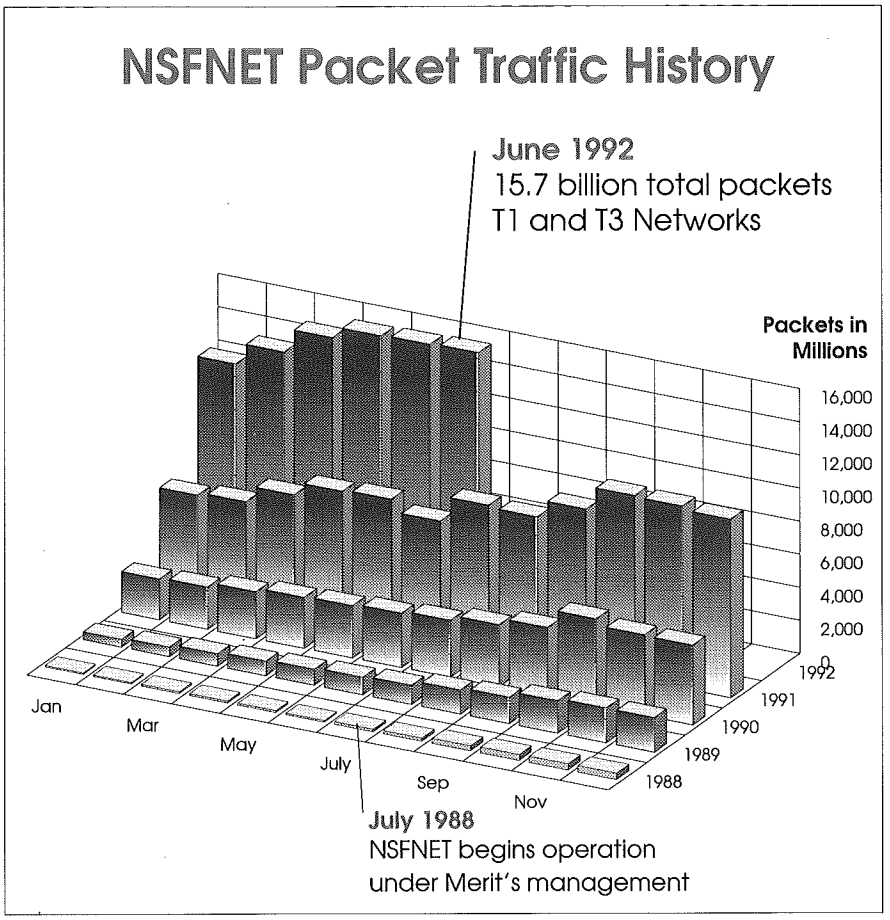
Give the Cruise a try — you'll find it's easy to use and very informative.

Phase 3 *cont. from page 3*

is a high degree of communication among the various network engineers and problems can usually be resolved quickly when reported," Knopper said. "Merit engineering staff will be happy to assist with problems that are difficult to resolve at the local level," he added.

FDDI upgrade scheduled

The throughput that may be achieved by users of the T3 backbone will improve dramatically with the forthcoming FDDI upgrade which is scheduled to begin in August. The process will replace the older FDDI cards with RS/960 FDDI interfaces following extensive testing on the test network. The two-phase plan for the interface replacements reflects a conservative approach to upgrade deployment ensuring continued network stability.



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[1]